

**REMARKS/ARGUMENTS**

Under the Office Action mailed January 24, 2003, claims 1-18 were examined. Claims 1-4, 6-13 and 15-18 were rejected, and claims 5 and 14 were objected to but otherwise indicated allowable if rewritten in independent form incorporating all of the limitations of their base and any intervening claims.

The title of the invention was considered not descriptive so it has been amended to more clearly be indicative of the invention to which the claims are directed.

The specification has been amended to correct obvious idiomatic errors and to update the status of previously referenced patent applications. Since no new matter is being introduced by way of these amendments, it is respectfully requested that they be accepted.

New claims 19 and 20 have been added. New claim 19 is a combination of original claims 1 and 5, and new claim 20 is a combination of original claims 10 and 14. Since the combinations which the new claims represent were previously indicated allowable, it is respectfully that they now be allowed. Claim 10 was amended to correct a spelling error.

It is respectfully requested that the rejections of claims 1-4, 6-13, and 15-18 be reconsidered and withdrawn for the following reasons.

The present invention relates to apparatus and methods by which the *local* surface characteristics of photolithographic mirrors or the like may be interferometrically measured *in-situ* with dynamic interferometers to provide correction signals for enhanced distance and angular measurement accuracy. Surface characterizations along one or multiple datum lines in one or more directions may be made by measuring angular changes in beams reflected off the surfaces during scanning operations to determine local slope and then integrating the local slope to arrive at surface topology. The mirrors may be mounted in situ on a photolithographic stage or off the stage on a reference frame. As stated in the specification at page 11, lines 26-31:

"An important feature of the use of single beam interferometers for this application is it contains all spatial frequencies up to the cutoff frequency given by  $1/d$ , where  $d$  is the beam diameter whereas use of a double beam interferometer, such as the HSPMI, would cause loss of all spatial frequencies that have wavelengths equal to the beam

spacing of the two double beams or harmonics thereof so the shape could not be recovered."

Thus, "local" as used in the claims means that the invention is capable of measuring mirror properties *in situ* over the diameter of a single interferometer beam. The principal reference to Kamiya used to support the '102 and '103 rejections emphatically does not teach or suggest measuring local mirror characteristics *in situ* and, indeed, is capable of this given that it advocates the use of two spaced apart displacement interferometers to measure average mirror slope over the distance separating the interferometers. Kamiya's Fig. 5 clearly shows that Kamiya does not measure local mirror characteristics *in situ*. As seen there, the high spatial frequency properties of a mirror are first measured off-stage with a Fizeau interferometer. A mirror that has been measured with a Fizeau off-stage is then installed on a stage, and its low frequency spatial properties are then measured by a pair of spaced apart displacement interferometers. This low frequency information is then mathematically matched to the previously obtained high frequency off-stage information to obtain a final correction function through the use of interpolation techniques. This is distinctly different from what the present invention teaches and claims and assumes that the high frequency information measured off-stage with the Fizeau interferometer remains valid after the mirror is installed on a stage. That is, the mirror is assumed to undergo only low frequency distortions as a result of its being mounted on the stage. Thus, Kamiya does not measure all spatial frequencies *on-stage*, measures pairwise only an average slope between two displaced points at a time, and can't connect line pairs since there is no intervening slope information.

The present invention avoids these elaborate off-stage, on-stage steps that require subsequent mathematical manipulation and makes no assumptions about how the mirrors will be changed as a result of mounting. Indeed, the mirrors in the present invention are not measured until after they have been installed either on the stage or the reference frame. Thus, It is only after their installation that the mirrors of the present invention are measured, and then to their high frequency content limited by the reciprocal of the beam diameter, and not the spacing between two spatially separated beams, as in the Kamiya reference.

The Office Action stated that claims 1, 2, 4, 6, 8-11, 13, 15, 17-18 were anticipated by Kamiya. That is, it asserted that Kamiya is a single reference that contains each and every element set forth in those claims. This clearly is not the case. Claims 1 and 10, the independent claims, first require the mirrors to be mounted in a predetermined manner with respect to the reference frame (or stage) as their local properties are being measured. These claims further require interferometer subsystems adapted to scan the mirrors while they are mounted to measure local slope and displacement normal to the mirror reflecting surfaces. Kamiya clearly does not show or describe this but rather measures "average" slope, the slope available by taking the displacement data between two spaced apart interferometers while accounting for the distance separating the points from which that data was measured. Further, the instant claims require a control means for providing a mode of operation in which information about the local properties of the mirrors is obtained for subsequent downstream signal processing which completely characterizes the mirrors locally. Kamiya also does not teach this either.

Consequently, it is respectfully submitted that Kamiya does not meet the legal requirements to sustain a rejection of the foregoing claims under 35 USC 102(b) and that those rejections be withdrawn.

Claims 6 and 15 were rejected under Kamiya on the basis that Kamiya discloses a laser interferometer and the fact that single beam, plane mirror interferometer subsystems are well known. This cannot be a proper '102 rejection since it combines features of a principal reference with other assertions about the content of what is well known in the art. Moreover, Kamiya does not disclose a single interferometer, but rather, two displacement interferometers to measure low spatial frequency content through the expediency of measurements of "average" angle. Consequently, it is respectfully requested that this ground for rejection be withdrawn.

For the foregoing reasons, it is believed that the clear teachings and content of Kamiya have been misconstrued and legally misapplied in support of the '102 rejections and upon reconsideration should be withdrawn.

Claims 3, 7, 12, and 16 were rejected under 35 USC 103(a) as being unpatentable over Kamiya. For the reasons set forth above, the principal reference to Kamiya as applied fails to meet the factual and legal standards necessary to function as

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a principal reference in rejecting the base claims from which claims 3, 7, 12, and 16 depend. Since the rejections under '103 rely on the propriety of the Kamiya reference, they cannot be sustained because Kamiya is a flawed principal reference for reasons already set forth above. Further, the '1-3 rejections rely on assertions about how one skilled in the art would have modified the flawed Kamiya reference to arrive at the invention set forth in the claims rejected under '103. Clearly, the shortcomings of Kamiya as a '102 rejection cannot be repaired so that to operate as the legally valid basis for a '103 rejection. Consequently, it is respectfully requested that all '103 rejections be withdrawn as well.

In view of the foregoing, Applicant respectfully requests that a timely Notice of Allowance be issued in this application.

As one excess new independent claim has been added over the number previously paid for, a check for \$84.00 has been attached to the letter transmitting this paper.

Should an extension of time be required, please consider this a request therefor and charge my Deposit Account No. 03-1150 for any required fee.

Should the Examiner have any questions, wish to discuss any aspect of this response, or conduct an interview, please do not hesitate to contact me.

Respectfully submitted,



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Date